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AUTUMN OWL MIGRATION AT CAPE MAY POINT, NEW JERSEY

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ABSTRACT.—During autumn migration 1980–1988, 1042 owls of seven species were captured and banded at Cape May Point, New Jersey. Northern Saw-whet Owls (*Aegolius acadicus*) accounted for 61% of owls banded and Long-eared Owls (*Asio otus*) and Barn Owls (*Tyto alba*) together accounted for another 37%. The migration of barn owls commences in the last days of September, with 90% of captures occurring before 9 November. The seasonal migration of Saw-whet and Long-eared owls is nearly identical, with 90% of captures of these species occurring by 18 and 21 November, respectively. Substantial numbers of the birds migrating through Cape May were adults (after hatch year): 32.5% of Saw-whet, 19.5% of Barn, and 26.1% of Long-eared owls. Adult Saw-whet and Long-eared owls migrated slightly later in the autumn than immatures, whereas adult barn-owls migrated slightly earlier than immatures. Overlap in seasonal timing between age classes was great. More owls were captured during the four hours before sunrise than in the evening, reflecting low altitude flight of migrants seeking hunting or roosting sites after a night's migration. The large number of owls captured in this study demonstrates that the Cape May peninsula is part of a major migratory pathway and is an important stopover area for these animals. *Received 21 June 1991, accepted 5 Nov. 1991.*

Cape May Point, New Jersey, has long been recognized as an important aggregation site for migrating birds, especially raptors during autumn (Stone 1937, Dunne and Sutton 1986). The migration of owls, however, was overlooked until recently (Clark 1972, Duffy 1985). This paper summarizes the results of a banding study of migrating owls at Cape May Point between 1980 and 1988, with specific attention given to species composition, seasonal timing of migration by species, age, and sex classes, and the diel timing of capture of each species.

STUDY AREA AND METHODS

Owls were captured with mist nets and banded at six sites near the end of the Cape May peninsula in New Jersey (38°56′N, 74°58′W; Fig. 1). From 1980 to 1988, banding efforts were initiated each year between 28 September and 10 October (median date = 1 October) and ended between 22 November and 5 December (median date = 26 November). The average number of nights on which nets were used during the nine-year study was 43.7. Use of each of the sites, as well as capture effort (number of nets and net-h) varied from year to year as a result of varying water level, succession of habitats, changes in land ownership, and presence of mammalian predators. The sites are as follows: Site 1.—A "pocket" of brackish marsh (about 1.2 ha) surrounded by upland forest and wetter marsh. The site was dominated by *Spartina patens, Juncus* sp., and *Distichlis* sp. Site 2.—A "pocket" of brackish

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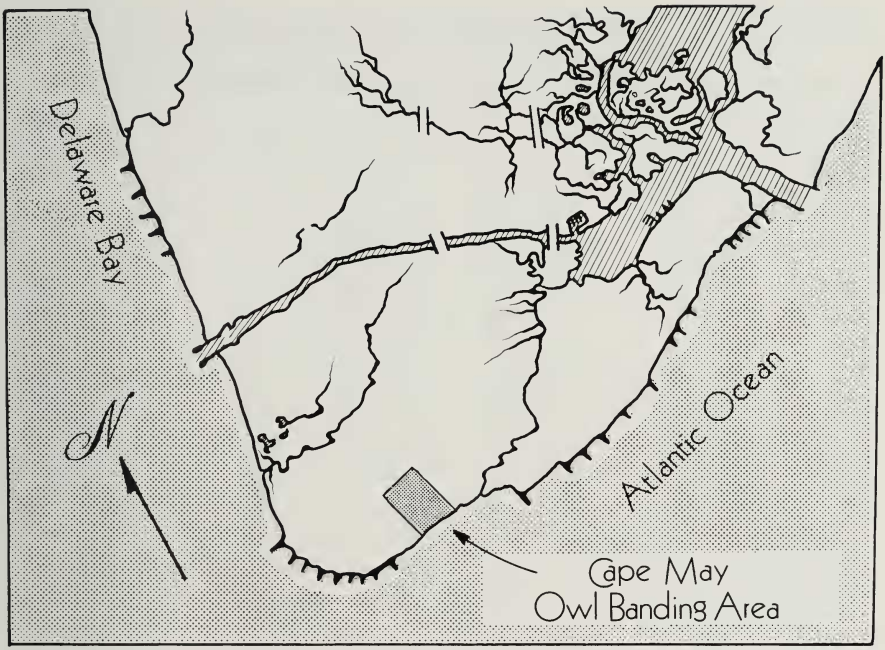


FIG. 1. Map of Cape May Point, New Jersey showing banding area.

marsh bounded on one side by a larger marsh and on the other by upland forest. The size of this "pocket" and vegetation was about the same as Site 1. This site and Site 1 were not used during 1988 when 0.5 m of water was present. Between 1980 and 1988 the size of these "pockets" was reduced by more than 50% as a result of the incursion of *Phragmites communis*. Site 3.—A cultivated field planted with a grassy winter cover crop—surrounded by dry forest. Nets were placed along the west edge of the field approximately 2–3 m from the forest edge. Site. 4.—Red cedar (*Juniperus virginiana*) grove (ca 6 ha) with a partially open canopy—adjacent to wet meadow and a dry forest. Nets and verbails were first used in this field in 1984. Site 5.—Wet and dry meadow with some *Iva*—adjacent to dry forest and ocean dune system. This site was first used in 1984. Site. 6.—Hay field between *Phragmites* marsh and wet forest. This site was used in autumn 1988 when Sites 1 and 2 were flooded. Ten nets were placed along the edge of the field within 2–4 m of upland forest or along the edge of a *Phragmites* marsh.

Between 23 and 52 mist nets were used to capture owls each night (Table 1). The number of net-h each year ranged from 9767 to 26,173. Mist nets were 12 m long and 2.5 m high, usually with 61 mm mesh. Five to ten of the nets used each fall had 121 mm mesh that is more effective for capturing larger owls. A maximum of 12–25 verbail traps were used in a given year. These were placed in grassy areas where owls might hunt from perches. Nets and traps were opened at sunset, closed about 1 h before sunrise, and checked at intervals of 1–2 h. Net checks were more frequent on nights when many owls were captured and when temperatures dropped to <5°C. Nets and traps were not operated on nights when winds were >30 km-h^{-1} or during precipitation or fog. Owls were banded with U.S. Fish and Wildlife Service aluminum tarsal bands, aged, measured (wing chord and mass), and

TABLE 1

SUMMARY OF OWLS BANDED AND NETTING EFFORT AT CAPE MAY POINT, NEW JERSEY, 1980–1988

Year	Saw-whet Owls[a]	Common Barn-Owls[a]	Long-eared Owls[a]	Yearly total[b]	Net-h	Number nights
1980	115 (18.3%)[c]	50 (18.0%)	48 (8.3%)	214	11,375	46
1981	109 (33.0%)	44 (20.5%)	24 (33.3%)	179	15,552	47
1982	53 (58.5%)	20 (25.0%)	14 (14.3%)	89	9767	36
1983	79 (34.2%)	26 (7.7%)	19 (47.4%)	127	12,765	44
1984	8 (87.5%)	1 (0.0%)	14 (64.3%)	29	26,173	49
1985	30 (13.3%)	4 (0.0%)	8 (25.0%)	49	23,870	40
1986	78 (23.1%)	15 (13.3%)	5 (20.0%)	104	17,329	49
1987	72 (43.1%)	7 (28.6%)	16 (62.5%)	96	17,119	44
1988	87 (34.5%)	13 (38.5%)	55 (14.5%)	155	12,413	38
Totals	631 (32.5%)	180 (19.5%)	203 (32.2%)	1042[b]	146,363	393
Mean	70.1	20	22.6	115.8	16,263	43.7
SD	34.9	17.2	17.4	56.3	5287	4.4

[a] Percentage of adult (AHY) birds captured.
[b] Totals include one Short-eared Owl (*Asio flammeus*), 19 Eastern Screech-Owls (*Otus asio*), seven Great Horned Owls (*Bubo virginianus*), and one Barred Owl (*Strix varia*).
[c] Percentages are in parentheses.

released. Owls were aged as adults (AHY = after hatch year) by the presence of more than one generation of flight feathers or as immatures (HY = hatch year) by the presence of only one generation of flight feathers. Other techniques for determining age were from Anonymous (1980).

RESULTS

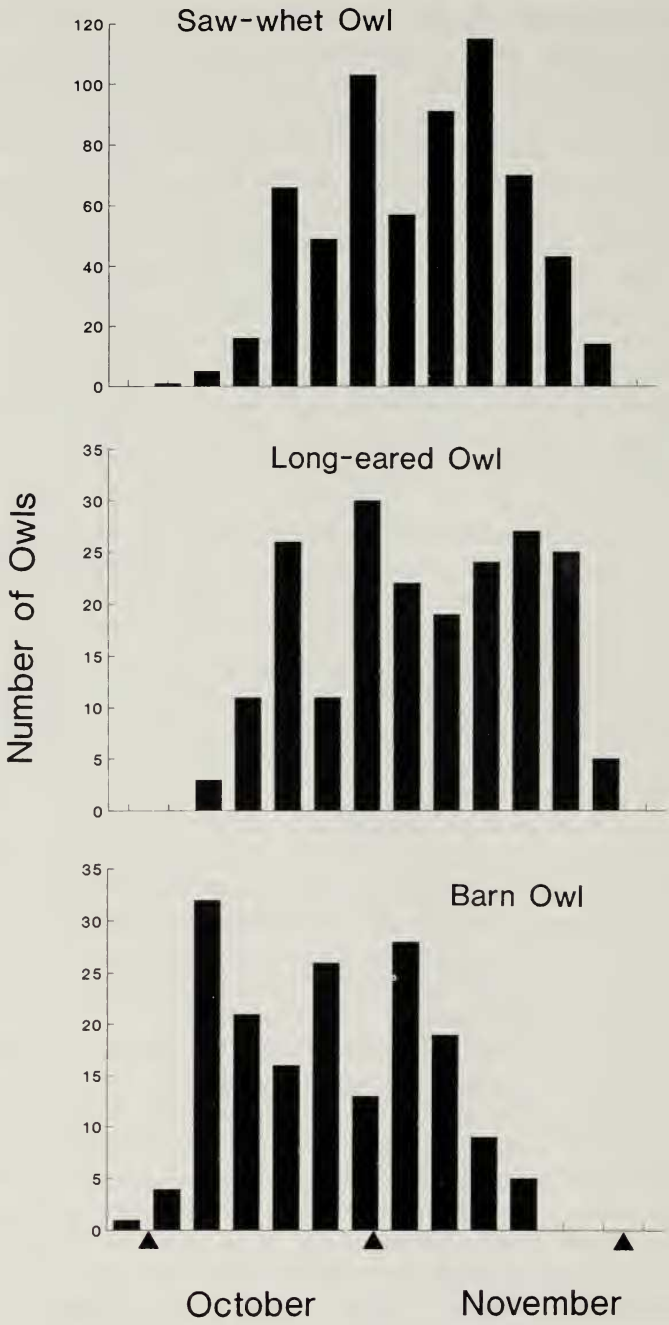
Species composition.—In the nine years of owl banding reported here, 1042 individuals of seven species were captured (Table 1), an average of 116 owls per year. The numbers of owls captured varied among years with only 29 being captured in 1984 and 214 captured in 1980. Three species accounted for more than 97% of all owls captured. Northern Saw-whet Owls (*Aegolius acadicus*) were most numerous (60.6%), followed by Long-eared Owls (*Asio otus*—19.5%) and Barn Owls (*Tyto alba*—17.3%). The remaining 28 owls (Table 1) were from four species. The proportion of adult (AHY) birds captured varied among species. These percentages include a small number of birds (6 Long-eared Owls, 12 Saw-whet Owls, and 3 barn owls) for which age determination was not made or was equivocal. A slightly greater percentage of Long-eared (26.1%) and Saw-whet owls (32.5%) were adults than were barn owls (19.5%). In 1984, when owl captures numbered about one-quarter the mean capture rate for the nine-year study, adults accounted for 87.5% of Saw-whet Owls and 64.5% of Long-eared Owls. These percentages are higher than for any

other year of the study, although there appears to be no relation between the numbers of owls banded and the percentage of adult birds.

Seasonal timing of migration.—Owl migration through Cape May commences in September and continues into December (records of Cape May Bird Observatory). Prior to October and after November, however, the number of migrants is small in comparison with the numbers captured during our study. An exploratory study before 1980 demonstrated the futility of attempting to capture owls during September and December. Large numbers of owls do not begin to migrate through Cape May until the second week in October. Capture rates before the second week of October are so low as to discourage banding efforts (Fig. 2). A few barn-owls migrate before the initiation of autumn banding activities (records of Cape May Bird Observatory). In general, barn-owls migrate earlier than Saw-whet and Long-eared owls by about two weeks (Fig. 2). Nearly 90 (89.1%) percent of barn-owl captures occurred between 6 October and 9 November (Fig. 2), with 50% of the flight passing by 23 October. By 9 November, about 90% of barn owls had passed. The migration of Saw-whet and Long-eared owls commenced in mid-October. Approximately ninety percent of Saw-whet Owls passed between 16 October and 19 November, whereas 90% of Long-eared Owls passed between 16 October and 24 November (Fig. 2). The mid-migration (50% of captures) dates for Saw-whet Owls was 7 November, with 90% passing by 18 November. For Long-eared Owls mid-migration occurred on 4 November, and 90% had passed by 21 November. Thus, the migration period for these species in Cape May is virtually identical.

Adult barn-owls seem to migrate, on average, a few days earlier than immatures (Fig. 2). By the end of October, 85.3% (29 of 34) of the adult barn-owls observed had been captured, but only 60.6% (83 of 137) of the immatures had been captured. No adults were noted after 9 November, whereas 14 (10.2%) immatures were noted after this date. The difference in frequencies of adult and immatures between October and November, though small, was significant ($\chi^2 = 7.26$, df = 1, $P < 0.01$).

For both Saw-whet and Long-eared owls, adults migrated slightly later in autumn (Fig. 2). A slight, but significant difference was noted among the frequencies of adult and immature Saw-whet Owls captured during October and November ($\chi^2 = 7.46$, df = 1, $P < 0.01$). Slightly more than thirty percent (30.7%) of all adult Saw-whet Owls were captured in October as opposed to 42.1% of immatures. After 10 November the percentages changed to 43.4% of all adults and 35.1% immatures. A more obvious difference was noted among Long-eared Owls in which only 9.4% of adults (5 of 53) migrated in October compared with 52.1% of immatures (75 of 144). Two-thirds of all adults of this species migrated after 10 November,


Saw-whet Owl
120
100
80
60
40
20
0
Long-eared Owl
35
30
25
20
15
10
5
0
Number of Owls
Barn Owl
35
30
25
20
15
10
5
0
October
November

whereas only 29.2% (42 of 144) of immatures migrated after this date. When the frequencies of adults in October and November were compared statistically, the differences were significant ($\chi^2 = 29.20$, df = 1, $P < 0.01$). There was far more overlap among the age groups of Saw-whet Owls. Overall, the differences for Long-eared Owls appeared to be more marked than among Saw-whet Owls and barn-owls.

Regression analysis of wing chord on date revealed no trend suggestive of a seasonal difference in migration timing between the sexes. Because females have longer wing chords than males (Snyder and Wiley 1976), we reasoned that if a sexual difference in seasonal timing of migration occurred, it would be revealed by regression analysis. We conducted three regressions for each of the three species; one for after hatch year (AHY), one for hatch year (HY), and one for AHY and HY birds combined. Not one of the nine regressions revealed a hint of any seasonal differences in migration timing between the sexes. Maximum regression coefficients accounted for less than 0.025 (2.5%) of the variance. Sample sizes are slightly smaller than those given for each species in Table 1 because wing chords for several individuals were not measured.

Diel timing of migration.—To determine if there was a statistically significant diel pattern (departure from equiprobability) of capture frequency, nights were divided into three, roughly equal (4 h) periods. Among all three species of the common migrants, more birds were captured in the period just prior to dawn than in either the middle of the night or early in the evening (Fig. 3). The trend is particularly strong for both Long-eared Owls ($\chi^2 = 58.87$, df = 2, $P < 0.01$) and barn owls ($\chi^2 = 63.19$, df = 2, $P < 0.01$) in which 60.3% and 65.7% were captured in the four hours preceding sunrise. The percentages captured during the first and second four-hour periods after sunset were roughly the same for these species. The trend is present but less marked among Saw-whet Owls ($\chi^2 = 14.90$, df = 2, $P < 0.01$) for which only 40.2% of the captures were made in the four hours preceding sunrise.

DISCUSSION

The significance of the Atlantic Coast as a migratory pathway with stopover sites for owls has been overlooked. In his classic work about the ornithological significance of Cape May, Stone (1937) omitted mention of the substantial owl migration, although he did say that the barn owl

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FIG. 2. Seasonal timing of migration patterns for adult (hatched) and immature (solid) Saw-whet Owls, Long-eared Owls, and Barn Owls during autumn migration at Cape May Point, New Jersey. Each bar represents a five-day period.

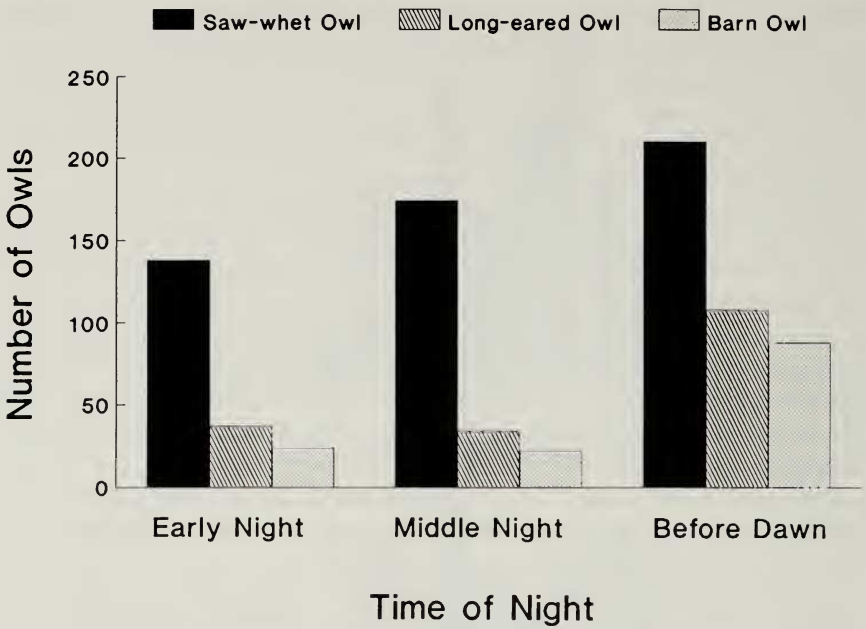

FIG. 3. Diel timing of captures of Saw-whet Owls, Long-eared Owls, and Barn Owls at Cape May Point, New Jersey, 1980–1988. The three periods (early, middle and late) represent roughly equal (about 4 h) portions of the night.

was a "regular autumn transient . . . occurring most frequently during October." Like raptors, songbirds, and many other species of birds, numbers of owls are concentrated near the tip of the Cape May peninsula. Unlike the concentrations of raptors and songbirds at Cape May and along the New Jersey coast, a larger proportion of the owls are adults. The percentage of adults among the raptors and songbirds that migrate through Cape May and along the Atlantic coast rarely exceeds 15% (unpubl. data, Cape May Bird Observatory; Murray 1966). The percentage of adults among the owls banded was between 19.5 and 32.5% for the three most common species. Few migrating owls are banded at more southerly latitudes than our station and at no other location is there known to be a concentration of migrating barn owls. The latter finding was first reported by Duffy (1985), and this report lends credence to her contention that there is a seasonally predictable migration of this species. Most owl banding projects that focus on capturing migrating owls are to the north, most by several hundred kilometers (mostly north of 43°N) at sites such as Whitefish Point, Michigan (Carpenter 1987); Braddock Bay, New York (J. Dodge, pers. comm.); Cedar Grove, Wisconsin (Mueller and Berger 1967); and Long Point, Ontario (Weir et al. 1980).

With respect to diel timing of captures, our data show that owls are more likely to be captured in the four h preceding dawn. This is similar to the findings of Weir et al. (1980) for Saw-whet Owls. Russell et al. (1991) relied on visual observations (aided by an image intensifier) at Cape May Point to document that the largest numbers of migrating owls occur in the first few hours after sunset. It is possible that both observations are correct. Like other nocturnal migrants (Kerlinger and Moore 1989), owls may initiate migration within the first hour following sunset. Because our nets seldom exceeded 2.5 m in height, we suggest that the owls we captured were not actively migrating. Instead these owls had, more than likely, ceased migrating on that night and were either foraging or seeking a roosting site.

From our data we make two tentative conclusions. First, it is possible that barn owl populations are declining. A steady decline of barn owls between 1980 and 1988 was evident. The decline is even greater when data from a casual owl banding study in Cape May in the late 1970s is considered. In the latter study, up to 100 barn owls were banded in one season (W. S. Clark and M. Eloranta, unpubl. data). Because some of the best habitats for banding barn owls have changed so much as to preclude banding, we can only suggest that fewer individuals of this species now migrate through Cape May.

Finally, the differences in seasonal timing of migration between the ages should be considered suggestive. Although the differences in seasonal timing between adults and immatures were significant for all species, the distributions of passage dates overlap almost completely (Fig. 2). Thus, several more years of data are needed to confirm our findings.

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